

Hiroshi INOUE*: A new species of *Calypogeia* Raddi井上 浩*: *Calypogeia* 属の一新種***Calypogeia granulata*** Inoue, sp. nov.

Habitus similis *C. tsukushiensi*, sed differt (1) apicibus foliorum bifidis, (2) oleicorporibus botryoidibus.

Plants in deep green mats, on very moist rocks, (0.5)–0.8–1.5 cm long, 1.8–1.2 mm wide, loosely appressed to substrata, with \pm ascending apices. Stem about 200 μ thick, in cross section subglobose, 8–10 cells across, without differentiation of cells in size and cell-wall thickenings; branches quite few, mainly from the lower portion of shoot, postical intercalary, from underleaf-axils. Rhizoids frequent, restricted to the base of underleaves. Leaves imbricate, widely spreading, \pm or strongly incurved at apex, weakly incurved along ventral margin, dorsally not decurrent, subtransversely inserted to the stem midline, when flattened broadly ovate, 1100–1300 μ long and wide, with dorsal margin \pm ampliate toward the base, both margins entire, apex always bifid or with two distinct teeth; leaf-cells at the middle portion of leaves (38)–43–47–(52) \times (27)–32–40 μ , walls thin throughout the leaves, trigones absent, cuticle smooth. Oil bodies (2)–3–4–(5) per median leaf-cell, mostly fusiform and 5–10 \times 2.5–5.0 μ , or rarely 8–13 \times 4.5–6.0 μ , or sometimes globose and 2.5–3.5 μ , pale brownish blue or light blue, distinctly botryoidal, with numerous minute granules, surface finely papillose. Underleaves 500–560 μ wide \times 250–300 μ long, moderately decurrent at the base, with the insertion-lines distinctly \cap -shaped. Plants freely producing numerous, 2-celled gemmae on shoot apex which is obliquely or erectly ascending from substrata and with small leaves and underleaves; gemma-cells oblong, 22–30 μ long and 15–20 μ wide, pale green with chloroplasts. Plants sterile. Chromosome number $n=9$.

Type: Japan; Kuroyama, Iruma-gun, Saitama Pref., ca. 500 m. alt., on very moist rocks near water fall, leg. H. Inoue no. 18004 (TNS; duplicates in NY, NICH, JE, MASS, G).

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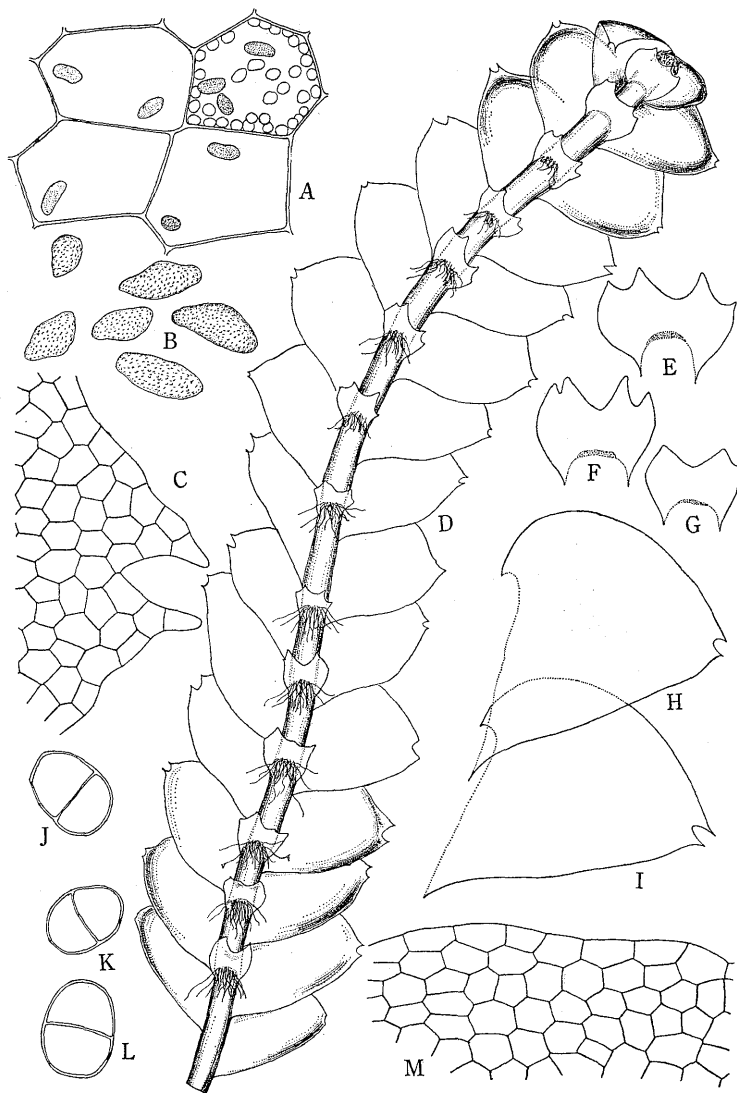


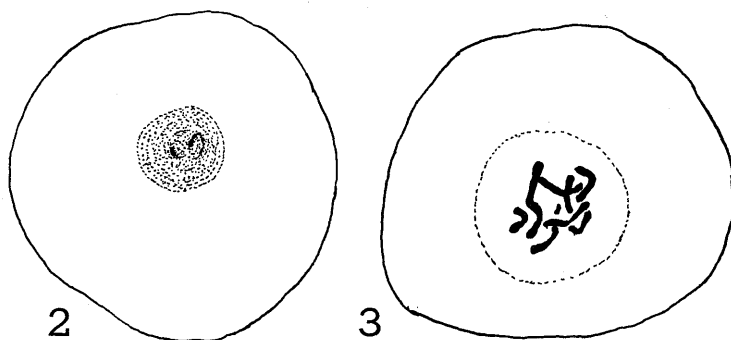
Fig. 1. *Calypogeia granulata* Inoue.

A. Cells from leaf-middle, showing oil bodies and chloroplasts (in one cell), $\times 433$. B. Oil bodies, $\times 1660$. C. Leaf apex, $\times 143$. D. Habit, postical view, $\times 35$. E-G. Underleaves, $\times 70$. H-I. Leaves, $\times 70$. J-L. Gemmae, $\times 433$. M. Cells from dorsal leaf-margin, $\times 143$. All figs. drawn by the type specimen.

Ecology: *Calypogeia granulata* formed pure, deep green mats on very moist rocks along stream or water fall; no other bryophytes intermixed. Neighbouring to the mats of *C. granulata*, there were also found large patches of *Plagiochila flexuosa* Mitt., *P. fruticosa* Mitt., and *Jungermannia rupicola* Amak. The valley, where *C. granulata* was found, is very shaded by the forest of *Cryptomeria japonica*.

Differentiation: *Calypogeia granulata* has apparently direct affinity to *C. tsukushiensis* Amak., an endemic species of Japan, which, however, clearly differs from *C. granulata* in that (1) the oil bodies have always a large "eye-spot", and (2) leaf-apices are narrowly rounded (in the original description, Amakawa (1958) said "sed saepicule bidentato" for leaf-apices; however, bidentate leaf-apices are very few and I have observed almost always rounded apices). The bifid leaf-apices suggest a close similarity to *C. tosana* Steph., a common species at lower altitudes in Japan, but in *C. tosana* the plants are pale green or pale yellowish green in color and the underleaves are bilobed to $1/2$ - $2/3$ the length, and the oil bodies are whitish gray, with (2)-3-6, large globules. Another allied species is *C. trichomanes* (L.) Corda which has blue oil bodies as in *C. granulata*; however, in *C. trichomanes*, the oil bodies are more deep blue and are composed of large globules in 2-3 rows, and the leaf-apices are almost always narrowly rounded.

The most characteristic feature for *C. granulata* is the distinctly botryoidal oil bodies which are brownish blue or light blue in color; this oil body type is very similar to that of *Metacalypogeia* (Hatt.) Inoue. One reason for separating *Metacalypogeia* from *Calypogeia* is that the oil bodies of *Metacalypogeia* are botryoidal and brownish and are rather numerous in number (usually more than 10 per cell; however, recently Hattori and Mizutani (1967) described *M. schusterana* which has only (2)-5-6 oil bodies per leaf-cell). The oil bodies of *C. granulata* are usually up to 4, rarely 5, per median leaf-cell (and even in basal leaf-cell) and brownish blue or light blue, and the surface is always very finely papillose due to minute, rather indistinct constituent granules (by the observation with oil-immersion system). By lower magnification, the oil bodies are very distinctly visible because of their dark bluish color. Although it has obviously *Metacalypogeia*-type oil bodies, *C. granulata* is still a species of *Calypogeia* with the following vegetative characters: (1) cell walls are very thin, without trigones and any secondary pigmentation,



Figs. 2-3. Resting nucleus and chromosomes of *Calypogeia granulata* Inoue. $\times 2460$.

and (2) free production of numerous gemmae at shoot apex. In *Metacalypogeia*, the asexual reproduction by gemmae seems to be absent (*if present*, very few); I have cultured *M. cordifolia* for long time but they have not produced any gemmiparous shoot, although the species of *Calypogeia* freely produced numerous gemmae at shoot apex under the same condition with *Metacalypogeia*. This nature of asexual reproduction of *Metacalypogeia* seems to be very important for generic separation from *Calypogeia*.

Chromosome number: A mat (ca. 10×10 cm) of *C. granulata* was cultured to check the chromosome number; the method used was described in Inoue (1967). I found 9 chromosomes in both gemma-cells and apical cells of shoot apex (fig. 2, 3). Among 9 chromosomes, the largest one (V-shaped) and smallest one were heteropycnotic at the resting stage as in other species of *Calypogeia*. The remaining 7 included 4 V-shaped chromosomes, and 3 J-shaped chromosomes. The chromosome number of 9 and karyotype of *C. granulata* are common with those of all examined species of *Calypogeia* and *Metacalypogeia* (Inoue 1967).

Summary

Calypogeia granulata Inoue was described as new; it was characterized by pale brownish blue or light blue oil bodies and bifid leaf-apices. The chromosome number was $n=9=H+4V+3J+h$ in both gemma-cell and cells at shoot apex. The oil body type cannot be used as one of the appropriate

criteria for separating *Metacalypogeia* from *Calypogeia*, while the mode of asexual reproduction is considered to be very important.

Literature Cited

- Amakawa, T. 1958. Notes on Japanese Hepaticae (8). Journ. Jap. Bot. 33: 336-343. Hattori, S. and M. Mizutani, 1967. *Metacalypogeia schusterana* and *M. quelpaertensis*. Miscel. Bryol. Lichenol. 4(8): 121-124. Inoue, H. 1967. Chromosome studies on some Japanese liverworts. Bot. Mag. Tokyo. 80: 172-175.

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日本産の *Calypogeia* 属についてはすでに筆者が 10 種についての総説を発表した (植研 41: 134-140, 1966) が, その後, 本属のもので明らかに未記載の種と考えられるものが埼玉県入間郡黒山三滝でみつかったので, ここに新名をつけて記載しておく。 *C. granulata* Inoue (ミドリホラゴケモドキ—新称; 植物体が濃緑色であることによる) は, 他の日本産の種類から次の点で区別することができる: (1) 葉は広卵状三角形で, とくに背縁は強い半円状の曲線となる; (2) 葉の頂端はつねに狭く, かつ浅く二裂する; (3) 葉細胞に含まれる油体はつねに無数の微小な粒子を含み, 青色又はやや褐色をおびた青色である。日本産の種類の中では *C. tosana* Steph., *C. tsukushiensis* Amak., 及び *C. trichomanes* (L.) Corda に似ているが, 上記した諸点でははっきり区別できる。黒山三滝の他に, 同じ埼玉県入間郡の名栗川附近でも本種に極めて類似したものを採っているが, 油体を確認していない。筆者が秩父多摩のタイ類をまとめた時 (服部研報 25: 186-216, 1962) には, *C. granulata* に当る黒山三滝, 名栗川の資料は不明の種として記録していない。

Calypogeia 属で油体が青色のものとして *C. trichomanes* だけが今まで知られていたが, *C. granulata* は第二番目の種類である。本種の油体型はその色を除けば全く *Metacalypogeia* 属の油体と同じである。 *Metacalypogeia* を *Calypogeia* から独立させる根拠の一つになった油体の形質は最早や用いられなくなるが, *Metacalypogeia* 属では無性芽による無性生殖をおこなわない点で, *Calypogeia* 属とはっきり異なる。